CLAIMS

What is claimed is:

1. An interferential optical filter, comprising multiple layers each having real and/or imaginary refraction indexes, the values of which depend on the strength of an external electric field,

wherein the refraction indexes and the thickness of each layer and their combination are selected such as to provide an interference extremum in at least one region of the spectrum for at least one polarization of incident light, and

at least one layer is made of an electro-optical material, said electro-optical material is anisotropic and made from at least one aromatic organic material, molecules or fragments of molecules of which have a flat structure, and at least part of said at least one layer has a crystalline structure with an intermolecular spacing of 3.4±0.2Å along one of optical axes.

2. The interferential optical filter according to claim 1, wherein at least one layer of the anisotropic electro-optical material is treated with ions of two- and three-valence metals.

3. The interferential optical filter according to any of claims 1 or 2, wherein the molecules of the at least one aromatic organic material contain heterocycles.

4. The interferential optical filter according to any of claims 1 to 3, wherein at least one layer of the anisotropic electro-optical material is made of lyotropic liquid crystal based on at least one dichroic dye.

5. The interferential optical filter according to any of claims 1 to 4, wherein at least one layer of the anisotropic electro-optical material is characterized by the imaginary (K_1, K_2, K_3) and real (n_1,n_2,n_3) parts of the complex refraction index, which satisfy the following correlations:

$$K_1 \geq K_2 > K_3, \text{ and}$$

$$(n_1+n_2)/2 > n_3.$$

6. The interferential optical filter according to any of claims 1 to 5, wherein the layers of the interferential filters are flat.

7. The interferential optical filter according to any of claims 1 to 5, wherein the layers of the interferential filters have shapes of the second order.

8. The interferential optical filter according to any of claims 1 to 7, further comprising at least one diffuse- or mirror reflecting substrate, or a substrate made of an optically transparent material.

9. The interferential optical filter according to claim 8, wherein the substrate is made of glass and/or quartz, and/or polymeric semiconductor, which is crystalline or amorphous.

10. The interferential optical filter according to any of claims 1 to 5, wherein a sidewall surface of at least one planar or cylindrical optical waveguide is used as a substrate for the filter.

11. The interferential optical filter according to any of claims 1 to 6, wherein at least one butt-end surface of at least one optical waveguide is used as a substrate for the filter.

12. The interferential optical filter according to any of claims 10 to 11, wherein at least one optical waveguide is a single-mode.

13. The interferential optical filter according to any of claims 10 to 11, wherein at least one optical waveguide is a multi-mode.

14. The interferential optical filter according to any of claims 10 to 13, wherein at least one optical waveguide contains at least one core and one or more claddings, which have refraction indexes less than the refraction index of the at least one core.

15. The interferential optical filter according to any of claims 1 to 6, wherein a flat side-surface of at least one optical D-shaped waveguide is used as a substrate for the filter.

16. The interferential optical filter according to any of claims 1 to 6 or 12 to 15, wherein the filter is formed on at least one butt-end of at least one optical waveguide, which is slanted at an angle from 0 to 90 degrees relative to the axis of the waveguide.

17. The interferential optical filter according to any of claims 1 to 16, further comprising at least one polarizing layer, and/or at least one phase-shifting layer, and/or at least one alignment layer, and/or at least one protective layer, and/or at least one mirror- or diffuse-reflecting layer, and/or at least one layer simultaneously functioning as any combination of at least two of the said layers.

18. The interferential optical filter according to any of claims 1 to 18, further comprising at least one pair of electrodes, which are under DC and/or AC voltage.

19. The interferential optical filter according to claim 18, wherein at least a part of at least one of the electrodes is made of an optical transparent material.

20. The interferential optical filter according to any of claims 18 to 19, wherein at least a part of at least one of the electrodes is made of an optical non-transparent material, which has at least one window transparent to light beam.

21. The interferential optical filter according to any of claims 18 to 20, wherein at least one pair of electrodes is situated on opposite surfaces of at least one layer of electro-optical material.

22. The interferential optical filter according to any of claims 18 to 21, wherein at least one pair of electrodes is situated on one surface of at least one layer of electro-optical material.

23. The interferential optical filter according to any of claims 18 to 22, wherein at least one pair of electrodes is situated on at least one butt-end of at least one layer of electro-optical material.

24. The interferential optical filter according to any of claims 18 to 23, wherein at least one pair of electrodes is situated on the different butt-ends of at least one layer of electro-optical material.

25. The interferential optical filter according to any of claims 18 to 24, wherein at least one layer of electro-optical material does not have electrical contact with at least one electrode, which belongs to at least one pair of electrodes, and voltage applied to this pair of electrodes creates electric field in said layer of electro-optical material.

26. The interferential optical filter according to any of claims 14 to 25, wherein at least one core of said optical waveguide further comprises at least one grating.

27. The interferential optical filter according to claim 26, which is formed on at least a part of the cladding of said optical waveguide and at least partially overlapping with at least one region of the core that comprises at least one grating.